

High-Average-Power Pulsed-Dye Lasers

State-of-the-art, high-average power and high-mean quality, pulsed-dye lasers

The Isotope Separation and Advanced Manufacturing (ISAM) Technologies program at LLNL has developed pulsed-dye lasers with excellent beam quality and a range of output power from tens of watts to the multi-kilowatt level. Our 2500-watt, copper-laser-pumped system, for example, is the world's most powerful dye laser. It has regularly been operated with high reliability for hundreds of hours in the industrial environment of LLNL's isotope-enrichment demonstrations. This laser has also been used for precision hole drilling in metals and other materials.

We have also developed a 30-watt, compact dye laser that is pumped by the second harmonic of Nd:YAG lasers. This system is being installed at Lick Observatory to produce a laser "guide star" for correcting the degradation of optical images

caused by the effects of atmospheric turbulence.

LLNL-developed high-efficiency laser dyes permit us to operate dye lasers at wavelengths from 550 to 700 nm. Any wavelength in this range can be chosen for the laser output and automatically controlled at that value with

very high accuracy. We have devised sophisticated beam-control systems to maintain the beam on target in the presence of vibrations and air turbulence. At the same time, pump-light delivery by large-core fiber optics greatly reduces alignment drift while permitting simple, yet highly flexible system configurations.



A dye laser power amplifier with fiber-to-amplifier relay (FTAR) in operation.

APPLICATIONS

- Advanced laser materials processing
- Laser "guide stars" for correcting viewing through atmospheric turbulence
- High-power, high-beam quality, pulsed-dyes lasers

Availability: This technology is available now. LLNL is actively seeking industrial partners with whom to further develop and apply these technologies.

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